Model MP-2

Mini Pulser Technical Manual

SALES

Eberline *A subsidiary of*
Thermo Instrument
Systems Inc.

GENERAL INFORMATION

Instruments for repair or calibration should be packaged, marked, or otherwise prepared in accordance with good commercial practices and shipped F.O.B. destination freight prepaid to one of the Eberline facilities below.

Repair and Calibration Facilities

Eberline Instrument Corporation
504 Airport Road
Santa Fe, NM 87504-2108
Attn: Western Service Center
(505) 471-3232
1-800-274-4212

Eberline Instrument Corporation
312 Miami Street
West Columbia, SC 29169
Attn: Eastern Service Center
(803) 822-8843
1-800-234-4212

Normal turn-around time for repair (Eberline instruments) is fifteen working days.

Normal turn-around time for calibration (Eberline instruments) is seven working days.

Prices (Subject to change without notice)

Certified calibration (Eberline portable instruments)(2 points/range)	
Unit and one probe	$90.00
Second probe	45.00
Third or fourth probe (Limited to 4 probes per instrument)	25.00
Certified calibration (other manufacturer's portable instruments)	90.00
ALPHA-3, ALPHA-5, AMS-3, HFM's, Portal Monitors, RM-22, SAM-2, WLM-1A, ESP-2 6112B, 6112D (certified calibration)	145.00
RGM-2 (certified calibration)	405.00
RGM-3 (certified calibration)	235.00
As found readings on any of the above, a charge of 50% of calibration rate shall be made.	
Calibrate "non-removeable" contaminated instruments	QUOTE
Services Contracts (Eberline equipment)	QUOTE
Technical Specification writing and Consultation	QUOTE
Service Engineer at Customers Site	$880.00/day plus expenses at cost +10% adm.
-Over 8 hours or Saturday and Sunday	165.00/hr
-Eberline Holidays	220.00/hr
Consulting	925.00/day
Repair rate (plus calibration and parts at list price)	85.00/hr
Repair "non-removeable" contaminated instruments	95.00/hr
Expediting Fee	50.00/ instrument
Accredited secondary standards laboratory calibration (Cs^{137} and Co^{60} photon)	QUOTE

Note: Repair and Calibration time on non-Eberline instruments is subject to availability of parts and literature for the specific instrument.

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Eberline warrants to replace or repair, at its option, any repaired products or replaced parts thereof (excluding tubes, crystals, batteries and normal consumables) which are found defective in material or workmanship within ninety (90) days from date of repair or the balance of the new purchase warranty, whichever occurs later. Instruments calibrated by Eberline are warranted to be within specified limits at time of shipment. In the event of calibration error, Eberline will again calibrate the instrument without charge to the instrument owner. The aforesaid warranty does not cover life-end failure of components and will be voided if repair has been attempted by other than seller's authorized personnel. In no event shall Eberline be liable for consequential or special damages, transportation, installation, adjustment, work done by customer or other expenses which may arise in connection with such defective product or parts.

Exclusion of Warranties and Limitation of Liability

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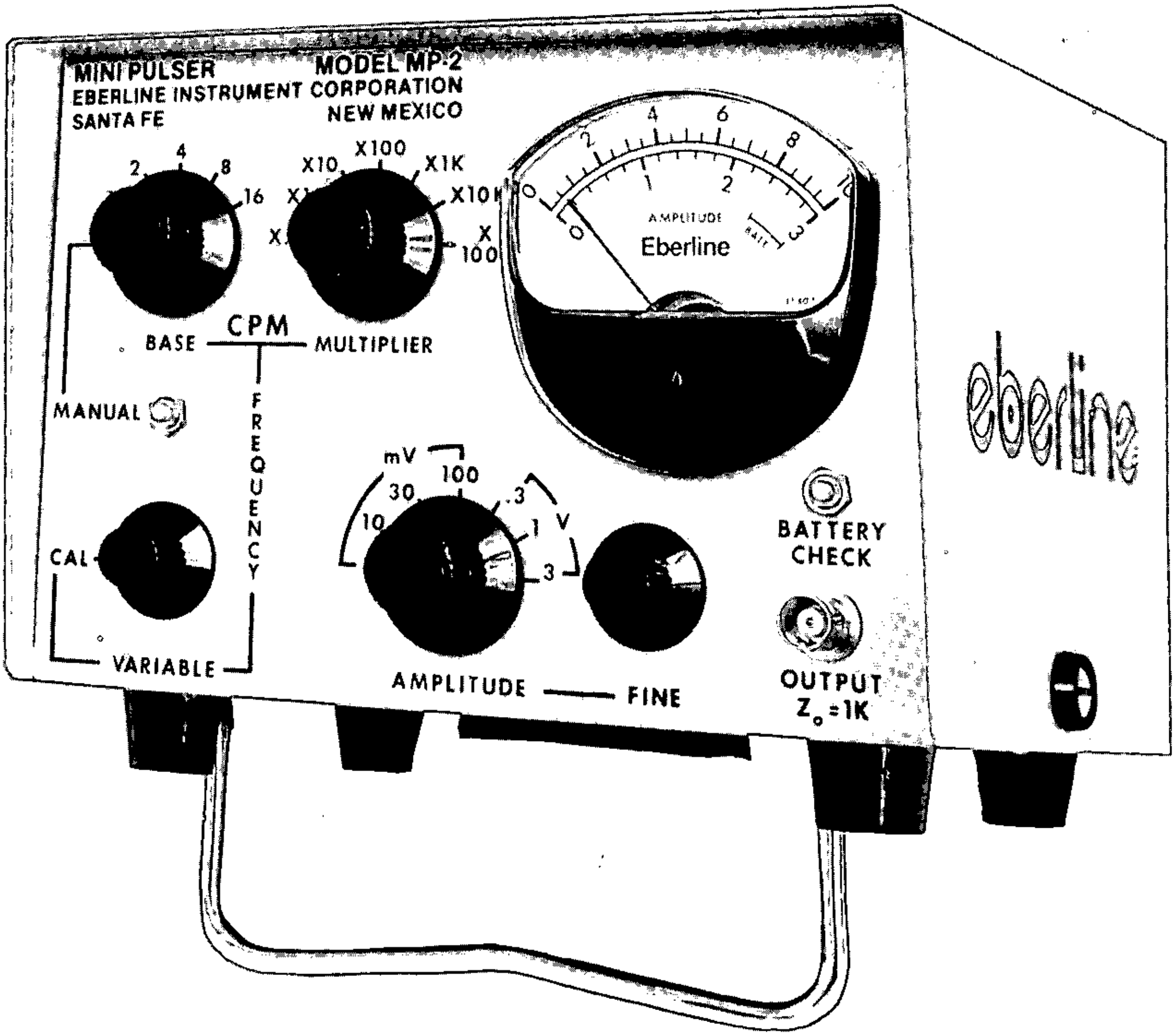


Figure 1-1. Model MP-2

SECTION I
GENERAL

A. PURPOSE AND DESCRIPTION

The Model MP-2 Mini Pulser is a small, lightweight pulse generator specifically designed to aid in calibrating and troubleshooting pulse counting instruments. The pulse repetition rate is variable from 0.1 counts per minute (cpm) to 1.6M cpm in either discrete steps of two or continuously. The accuracy is better than 0.1 percent when using the discrete steps. The analog pulse output has a pulse shape tailored to simulate most radiation detectors so the counting electronics will respond properly. The pulse amplitude is continuously variable from less than 1 mV to 3 V negative and is displayed on the front panel meter. The binary line driver output is tailored to drive Eberline's line of computerized system components and simulates the output of both the DA1-X and IB-X detector interface electronics. This output may also be used as an input for instruments with TTL (5 V) compatible inputs.

The MP-2 is powered by a 6 V rechargeable gel-type battery. A built-in float charger maintains the battery at full charge when the instrument is connected to line power. A battery voltage check is provided on the front panel to indicate battery charge when disconnected from the line.

All components, except the battery and its charger, are mounted on a single printed circuit board which is attached to the front panel. All integrated circuits are in sockets for ease of maintenance.

B. SPECIFICATIONS

1. Electronics

a. Frequency: Switch-controlled base of 1, 2, 4, 8 or 16 cpm with multiplying factors of 0.1, 1, 10, 100, 1k, 10k, or 100k provides a total span from 0.1 to 1.6M cpm accurate to better than 0.1 percent of the switch setting (when the variable control is in the calibrated position). Moving the variable control out of the calibrated position allows continuous variability of the frequency over an approximate range of the switch setting to a factor of two above the switch setting.

b. Amplitude: Switch-controlled coarse settings of 3, 10, 30, 100 mV and 0.3, 1, and 3 V full scale with fine control. The pulse amplitude is accurate to within ±10 percent of the meter reading, providing the load impedance is greater than 10 kΩ.

c. Pulse Shape: Negative pulse with approximate rise time of 0.2 μs, width of 2μS, and fall time of 3 μs.

d. Analog Output: Capacitively coupled for direct connection to counter input. Maximum dc voltage at the counter input is 1500 V. A BNC connector is utilized.

e. Analog Output Impedance: Approximately 1 kΩ.

f. Digital Output: Nominal 3.4 V (into a 50 Ω load) alternating polarity signal that changes state at one-half the selected frequency. Banana-type connectors—this is also referred to as the line driver output.

g. Battery Life: Greater than 250 hours continuous with no recharge when the line driver output is disabled. Approximately 20 hours when the line driver is used (depending on load).

h. Recharge Time: Approximately 36 hours to fully recharge a dead battery.

i. Temperature: 32° F to 140° F (0° C to 60° C) minimum range.

2. Mechanical

a. Size: 7.25 inches wide × 5.60 inches high × 6.60 inches deep (18.4 cm × 14.2 cm × 16.8 cm).

b. Weight. 3.5 pounds (1.6 kg)

3. Power Input: 120-240 Vac, 1/8 A, 50/60 Hz. Line filter assembly allows selection of 120 or 240 Vac operation.

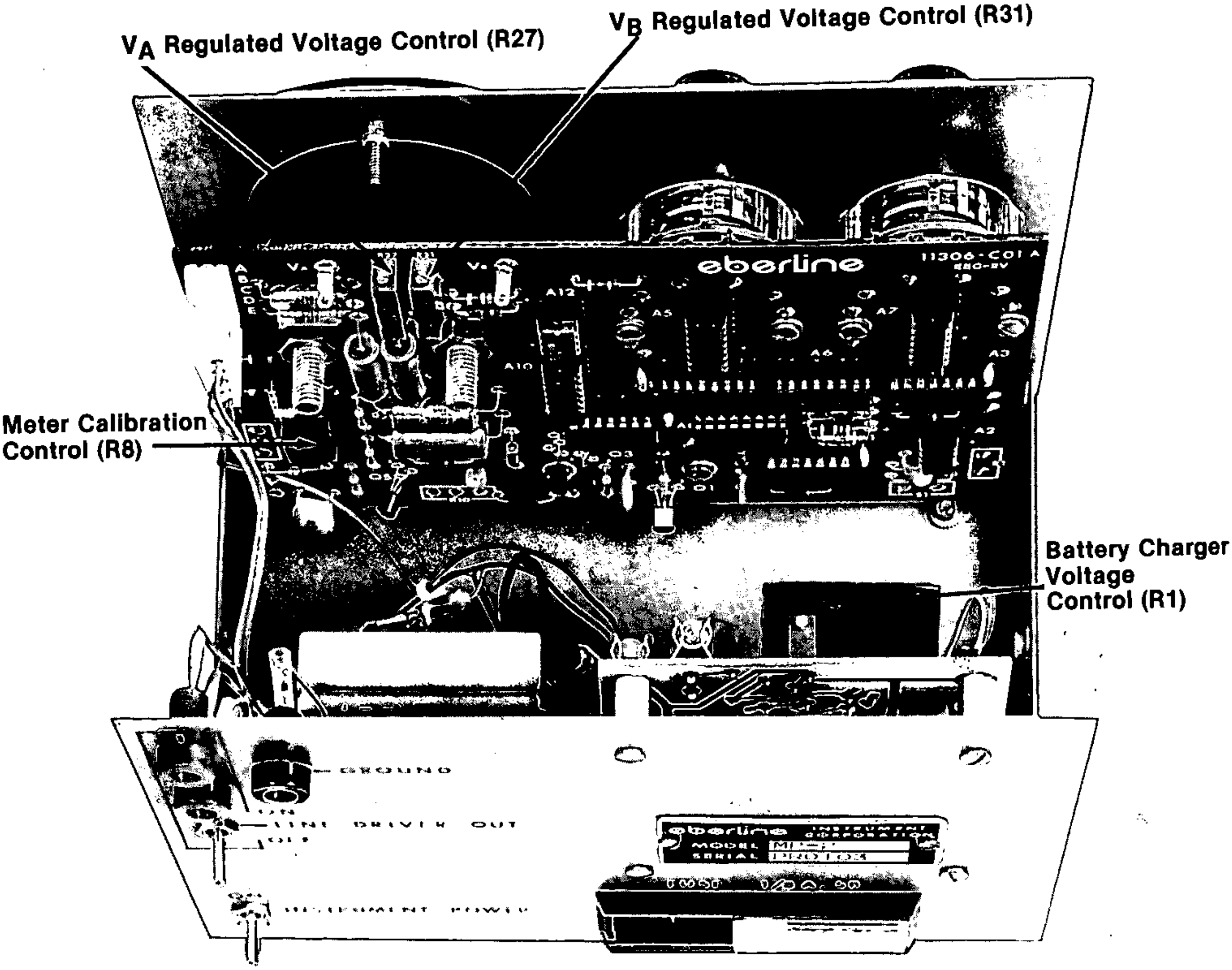

V_A Regulated Voltage Control (R27)
V_B Regulated Voltage Control (R31)
Meter Calibration Control (R8)
Battery Charger Voltage Control (R1)
eberline
GROUND
ON
LINE DRIVER OUT
OFF
INSTRUMENT POWER

Figure 2-1. Interior View of Model MP-2

SECTION II

OPERATION

A. DESCRIPTION OF CONTROLS AND CONNECTORS

1. Frequency: Four front panel controls determine the output pulse repetition rate in counts (pulses) per minute. All frequencies referred to are related to the front panel output connector. The rear panel binary line driver output changes state at the frequency set by the front panel controls. It has a repetition rate of ½ of the front panel settings.

a. *BASE:* Rotary switch establishes base repetition rate.

b. *MULTIPLIER:* Rotary switch establishes factor which is multiplied by the *BASE* number to determine the output repetition rate.

c. *MANUAL:* Push button for manual control of the output repetition rate. The *BASE* control must be in this position. The *MULTIPLIER* control has no effect. One pulse is output for each actuation.

d. *VARIABLE:* If this control is in the *CAL* position (fully counterclockwise), the output repetition rate is as described above. If not, the repetition rate is continuously variable from the *BASE* and *MULTIPLIER* determined setting to twice that value.

2. Amplitude: Two front panel controls, plus meter readout of the amplitude of the output pulses.

a. *COARSE:* Rotary switch establishes the amplitude range of the output. It is marked in mV and V for full-scale meter reading.

b. *FINE:* Controls meter reading and output pulse amplitude selected by the *COARSE AMPLITUDE* control.

3. Battery Check: Push-button control on the front panel that allows the battery voltage to be displayed on the meter. The battery range marks on the meter cover the approximate range from low battery voltage (5.25 V) to fully charged battery voltage (6.50 V). This reading reflects the battery voltage ONLY if the instrument is disconnected from line power. Otherwise, it will indicate the battery charger voltage (6.90 V), which is an above scale reading.

4. Output: BNC series coaxial connector.

NOTE

The output impedance is 1 kΩ, and the output amplitude is calibrated for a high load impedance. If the load impedance is 10 kΩ or less the loading effect must be taken into account.

5. Instrument Power: Toggle switch on the rear panel which turns instrument on or off. This control does NOT disable battery charging.

6. Line Driver Out: Toggle switch on the rear panel which turns on the line driver output. It is associated with three output connectors, one of which is ground (black). The other two (red) alternate polarity and are intended to drive the Eberline computer system's optically isolated inputs. They toggle at one-half the front panel frequency setting. This switch should ALWAYS be off UNLESS the outputs are being used. Instrument power consumption increases more than a factor of ten when this switch is on.

7. Power Connector: The power cord connector on the rear panel also serves as a fuse holder and 120/240 Vac selector switch. To change input voltage, remove the printed circuit card and reinsert it so that the desired voltage (either 120 or 240) is visible. When connected to an ac line, the charger is charging the battery. The instrument power switch does not control this charging function.

8. Internal Adjustments: Controls are mounted internally to control the battery charger voltage, low voltage power supplies, and the meter calibration. These are described in IV.B.

B. OPERATING THE INSTRUMENT

1. Connections: Connect a coaxial cable from the *OUTPUT* connector to the input of the instrument being tested. The shield should connect to ground and the center conductor to the input.

It is preferable to remove or turn down the high voltage in the instrument while testing. If this is impractical, the output of the MP-2 will withstand up to 1500 V.

If the MP-2 is being connected directly to an Eberline digital systems computer (a detector input/output board), connect the binary line driver outputs (the two red banana jack connectors) to the two computer inputs.

To connect to a TTL level input device, connect either of the red outputs to the device's input and the black connector to ground. Note: In either case the spacing between output jacks is ¾ inch.

2. Testing Input Sensitivity: Set a frequency output which is conveniently read on the instrument. Vary the amplitude controls until the point is found where the instrument is marginally counting the input pulses. Smaller pulses will not be counted and larger ones will be reliably counted. This is the input sensitivity of the instrument. (See note in II.A.4.)

3. Testing Count Rate Calibration: The frequency output is the number set on the *BASE* control multiplied by the *MULTIPLIER* factor. Turn the amplitude up approximately 150% from that determined in II.B.2 for reliable counting.

The reading that should appear on the instrument depends on how that instrument is calibrated. If calibration is in cpm referred to true frequency, it should read the exact number set on the MP-2. If calibration is in cpm referred to emission from a radioactive source, it will read higher by the efficiency of its detector. If calibration is to some other units, such as mR/h, it will read differently by the sensitivity of its detector to those units.

The linearity of the instrument can easily be checked by varying the output frequency of the MP-2.

4. Battery Check: The battery should be checked periodically by pressing the *BATTERY CHECK* button. The reading should fall above the low battery mark on the meter. The MP-2 MUST be disconnected from the line to test the battery.

SECTION III
THEORY OF OPERATION

A. FUNCTIONAL THEORY

Two voltage regulator circuits, A11 and A12, provide the supply voltages for the various logic devices on the board. A12 supplies power exclusively to the line driver output section, A10. Its input power source is switched by the rear panel *LINE DRIVER OUT* toggle switch, S8. This facilitates significant supply current savings by disabling the output driver when it is not required. A11 provides power for the remaining circuitry. Both regulators are adjustable using potentiometers R27 and R31.

Two oscillator circuits determine the basic operating frequency for the MP-2. When the *VARIABLE* control, Rl and Sl, is in the *CAL* position, Sl is closed, disabling the adjustable oscillator section, A2. The fixed oscillator is crystal (Xl) controlled at 26.667 kHz (1.60M cpm), and provides an accurate time base when exact pulse repetition rates are required. Moving Sl to the open position enables the variable oscillator, providing a base frequency over the approximate range of 26 kHz to 52 kHz and is controlled by potentiometer Rl. The base frequency from the selected oscillator section is applied to a series of divide-by-ten circuits (A4, A5, and A6), which provide frequency of 1.6M, 160k, 16k, 1.6k, 160, 16, or 1.6 cpm to the arm of the *MULTIPLIER* switch, S2. The selected signal is then applied to a string of 4-binary counters, A7, which divide the frequency by 2, 4, 8, or 16. Each of these frequencies is selectable by the *BASE* switch, S3. Thus, the arm of this switch can have frequencies of 16, 8, 4, 2, or 1 cpm or higher or lower by factors of 10, depending on the *MULTIPLIER* switch position. When the *BASE* switch is in the *MANUAL* position the output of a monostable, (A8), is applied to the wiper of S3. A8 is switched once each time that S4 is actuated. A8 is being used to debounce S4.

The signal on the arm of S3 is applied to a monostable, (A8), which provides a pulse with a 2μs width to the base of Ql and turns it on for 2μs. This results in a negative pulse at the collector of Ql with a fall time determined by C11. The amplitude of this pulse is determined by the dc voltage on the output of the voltage follower formed by Q2 and Q3. This is controlled by the *FINE AMPLITUDE* potentiometer, R10, mounted on the front panel. This voltage is also directed to the meter through meter calibration potentiometer R8. This is adjusted to limit the current through the meter thus calibrating it to represent pulse amplitude.

The pulses are then applied to a precision resistor string on the *COARSE AMPLITUDE* control, (S6). This provides attenuation factors of 1.0, 0.3, 0.1, 0.03, 0.01, 0.003, and 0.001 of the applied amplitude. From the switch arm the pulses are applied to a voltage follower, Q5. It has a very high input impedance to prevent loading of the attenuator. The output of the voltage follower is capacitively-coupled to the output connector. R23 and CR1 are for current limiting and voltage clipping. This prevents damage to Q5 in case the output is shorted when C10 is charged to a high dc voltage.

The line driver output section is formed by A9, A1, and A10. The switch-selected frequency is directed from the monostable A8 to a binary circuit, A9, which divides the frequency by two. The pulses are then buffered by A1 and applied to A10, which forms an alternating polarity line driver output.

SECTION IV
MAINTENANCE

A. PREVENTIVE MAINTENANCE

No particular preventive maintenance is required other than keeping the instrument clean and dry.

B. CALIBRATION

1. Battery Charger The battery charger printed circuit board must be adjusted to provide the proper battery charge voltage. To do this, connect a voltmeter between the cathode of CR1 (1N4001 diode) and ground and adjust the potentiometer so that the output voltage is 6.90 ± 0.05 V. This is best done with a charged battery and both the *POWER* and *LINE DRIVER* switches *ON*. If the battery is fully discharged, it should be disconnected before adjusting the voltage.

2. Regulated Voltage: The low voltage regulators on the main printed circuit board must be adjusted to the proper voltages. Connect a voltmeter to the test point V_A and ground and adjust R27 for 5.25 ± 0.05 V. Then connect the voltmeter to V_B and adjust R31 for 5.00 ± 0.05 V (note that the *LINE DRIVER OUT* switch must be *ON*).

3. Meter: The meter reading must be calibrated to agree with the output pulse amplitude. This should be done on the 100 mV scale. Adjust the *FINE AMPLITUDE* control for a 50 mV pulse amplitude at the output, as observed on an oscilloscope, then adjust R8 for a meter reading of 50 mV.

C. TROUBLESHOOTING

Most troubles can be isolated by tracing the signals through the instrument with an oscilloscope. Integrated circuits or transistors of the same type can be interchanged to aid in isolating troubles. The theory of operation section and the schematic should provide sufficient detail to determine the faulty component.

If the MP-2 fails to operate properly, the following items should be checked:

1) Verify that the battery charger is supplying the proper voltage to the main printed circuit board and that V_A and V_B are adjusted to 5.25 and 5.00 V, respectively.

2) Determine if the oscillator sections are providing the proper frequency (or range of frequencies for the variable oscillator).

3) Trace the oscillator output through the circuit, realizing that all the signals up to Q1 should be "square waves" and have frequencies which are factors of two and ten of the base frequency (26.667 kHz unless the variable oscillator is enabled).

4) The analog pulse at the collector of Q1 should vary from 3 V down, depending on the *FINE AMPLITUDE* control setting. The output amplitude should be attenuated from that on Q1's collector by the factor set on S6. Note that test probe loading will probably prevent making any voltage determinations on the base of Q5 due to the large impedance at that point.

SECTION V
PARTS LIST

The following table lists the mechanical items incorporated in the MP-2 and should contain any part necessary for normal repair. Unless otherwise specified, callouts of manufacturers and manufacturers' part numbers are to be considered typical examples only, and not restrictions against using equivalent parts with the same operating characteristics. When ordering parts from Eberline, specify model number, serial number, reference designation, value, Eberline part number, or a word description if the part has no reference designation. Eberline will automatically substitute equivalent parts when the one called out by the manufacturers' part number is not available.

REF DESIG	PART	DESCRIPTION	MANUFACTURER AND PART NUMBER	EBERLINE PART NUMBER
1. Battery Charger (Eberline No.YP11307020(0))				
T1	Transformer	10 V, 0.6 A	Microtran PSD4-10	TFPO38 (0)
A1	Rectifier			CRARVS0148 (7)
A2	Integrated Circuit	Voltage Regulator	MC7806CT	ICAV7806 (4)
C1	Capacitor	470 μF, 50 V	Sprague Type 513 D	CPAL471M3N (8)
CR1	Diode	Silicon	1N4001	CRSI1N4001 (3)
R1	Potentiometer	1 k	Bourns 3009P-1-102	PTCE102B23 (5)
R2	Resistor	10 k, 1/4 W, 5%		RECC103B22 (2)
F1	Fuse	1/2 A, 250 V	Slo-Blo, 3AG	FUSB6 (2)
2. Main Board (Eberline No. YP11306000(6))				
A1	Integrated Circuit	Inverter	RCA CD4069UBE	ICCMA4069U (1)
A2	Integrated Circuit	Timer	INTERSIL ICM7555IPA	ICCMA7555I (3)
A3	Integrated Circuit	NAND	RCA CD4011BE	ICCMA4011B (7)
A4, A5, A6	Integrated Circuit	Counter	RCA CD4518BE	ICCMA4518B (1)
A7	Integrated Circuit	Counter	RCA CD4024BE	ICCMA4024B (0)
A8	Integrated Circuit	Monostable	NATIONAL CD4528BCN	ICCMA4528B (0)
A9	Integrated Circuit	Flip-Flop	RCA CD4013BE	ICCMA4013B (3)
A10	Integrated Circuit	Line Driver	SN74128N T.I.	**ICTTA00128(0)**
A11, A12	Integrated Circuit	Regulator	INTERSIL ICL7663SCPA	ICAVA7663C (3)
C3, C5, C6, C9, C10, C14	Capacitor	0.1 μF, 50 V, 10%	Centralab CW20C104K	CPCE104P3N (7)
C4	Capacitor	20 pF, 1 kV, 10%	Centralab DD200	CPCE200P3U (3)
C1, C7	Capacitor	0.33 μF, 35 V, 10%	CS13	CPTA334P3L (2)
C2, C8	Capacitor	100 pF, 100 V, 20%	ERIE CK12 or EQUIV.	CPCE101P3P (1)
C11	Capacitor	0.002 μF, 1 kV, 20%	Centralab DD202	CPCE202P4U (7)
C12, C18, C19	Capacitor	120 μF, 10 V, 10%	CS13	CPTA121M3F (4)
C13	Capacitor	2.2 μF, 20 V, 10%	CS13	CPTA225P3I (7)
C15	Capacitor	330 μF, 6 V, 10%	SPRAGUE 150D337X9006S2	CPTA331M3D (1)
C16	Capacitor	0.001 μF, 3 kV, 10%	Centralab DD30-102	CPCE 472 P4Y ~~CPCE102P3Y (7)~~
C17, C20	Capacitor	10 μF, 20 V, 10%	CS13	CPTA100M3I (5)

REF DESIG	PART	DESCRIPTION	MANUFACTURER AND PART NUMBER	EBERLINE PART NUMBER
2. Main Board (Eberline No. YP11306000(6)) **continued**				
R2	Resistor	330k, 1/4 W, 5%		RECC334B22 (3)
R3	Resistor	100k, 1/4 W, 5%		RECC104B22 (0)
R4, R35	Resistor	470k, 1/4 W, 5%		RECC474B22 (7)
R5	Resistor	2.2k, 1/4 W, 5%		RECC222B22 (0)
R6	Resistor	20k, 1/4 W, 5%		RECC203B22 (0)
R7, R21, R22, R23	Resistor	1k, 1/4 W, 5%		RECC102B22 (4)
R8	Potentiometer	100k	Bourns 3299P-1-104	PTCE104B73 (0)
R9	Resistor	100 Ω, 1/4 W 5%		RECC101B22 (6)
R10	Potentiometer	100k, 10%	Allen Bradley WA2G040P104UA	PTCC104B23 (3)
R11	Resistor	130k, 1/4 W, 5%		RECC134B22 (7)
R12	Resistor	6.65k, 1%	RN55D	RECE662B12 (7)
R13	Resistor	2.32k, 1%	RN55D	RECE232B12 (9)
R14	Resistor	665 Ω, 1%	RN55D	RECE661B12 (9)
R15	Resistor	232 Ω, 1%	RN55D	RECE231B12 (1)
R16	Resistor	66.5 Ω, 1%	RN55D	RECE660B12 (1)
R17	Resistor	23.2 Ω, 1%	RN55D	RECE230B12 (3)
R18	Resistor	10 Ω, 1%	RN55D	RECE100B12 (8)
R19	Resistor	1.6 MΩ, 1/4 W, 5%		RECC165B22 (1)
R25, R29	Resistor	3 MΩ, 1/4 W, 5%		RECC305B22 (3)
R20	Resistor	2.7 MΩ, 1/4 W, 5%		RECC275B22 (8)
R24, R28	Resistor	12 Ω, 1/4 W, 5%		RECC120B22 (6)
R26, R30, R32	Resistor	820k, 1/4 W, 5%		RECC824B22 (3)
R27, R31	Potentiometer	500k, 10%	Bourns 3006P-1-504	PTCE504B03 (6)
R33	Resistor	22 MΩ, 1/4 W, 5%		RECC226B22 (1)
R34	Resistor	30k, 1/4 W, 5%		RECC303B22 (8)
X1	Crystal	26.67 kHz	STATEK CX-IV-A (SPECIAL)	CYOS10 (7)
Q1, Q2, Q3	Transistor	NPN	2N4124	TRSN2N4124 (2)
Q5	Transistor	PNP	2N4126	TRSP2N4126 (8)
CR1	Diode	Silicon	1N4148	CRSI1N4148 (7)
R1, S1	Potentiometer/ Switch	1 MΩ, 1/2 W		PTCC105B02 (5)
S2, S3, S6	Switch	Rotary	Centralab PA-1001	SWRO1 (8)
S4, S5	Switch	SPDT	C&K 8121-S-Y4-Z-GE	SWPB14 (3)

REF DESIG	PART	DESCRIPTION	MANUFACTURER AND PART NUMBER	EBERLINE PART NUMBER
3. Chassis Parts				
		MP-2 Meter Face		ZP11307005 (7)
		Powerline Filter	Corcom 6J4	MEVE4 (1)
		Powercord	Belden 17250	WRAC4 (4)
	Fuse	1/8 A, 250 V	Slo-Blo, 3AG	FUSB2 (1)
	Battery	6 V, Gel-Cel	Powersonic PS610 or Equiv.	BTGC2 (3)
		Switch, Toggle	Alco MST105D	SWTO12 (7)
	Meter	0-50 μA	Jewell MM2T	MTPA23 (4)

SECTION VI
DIAGRAMS

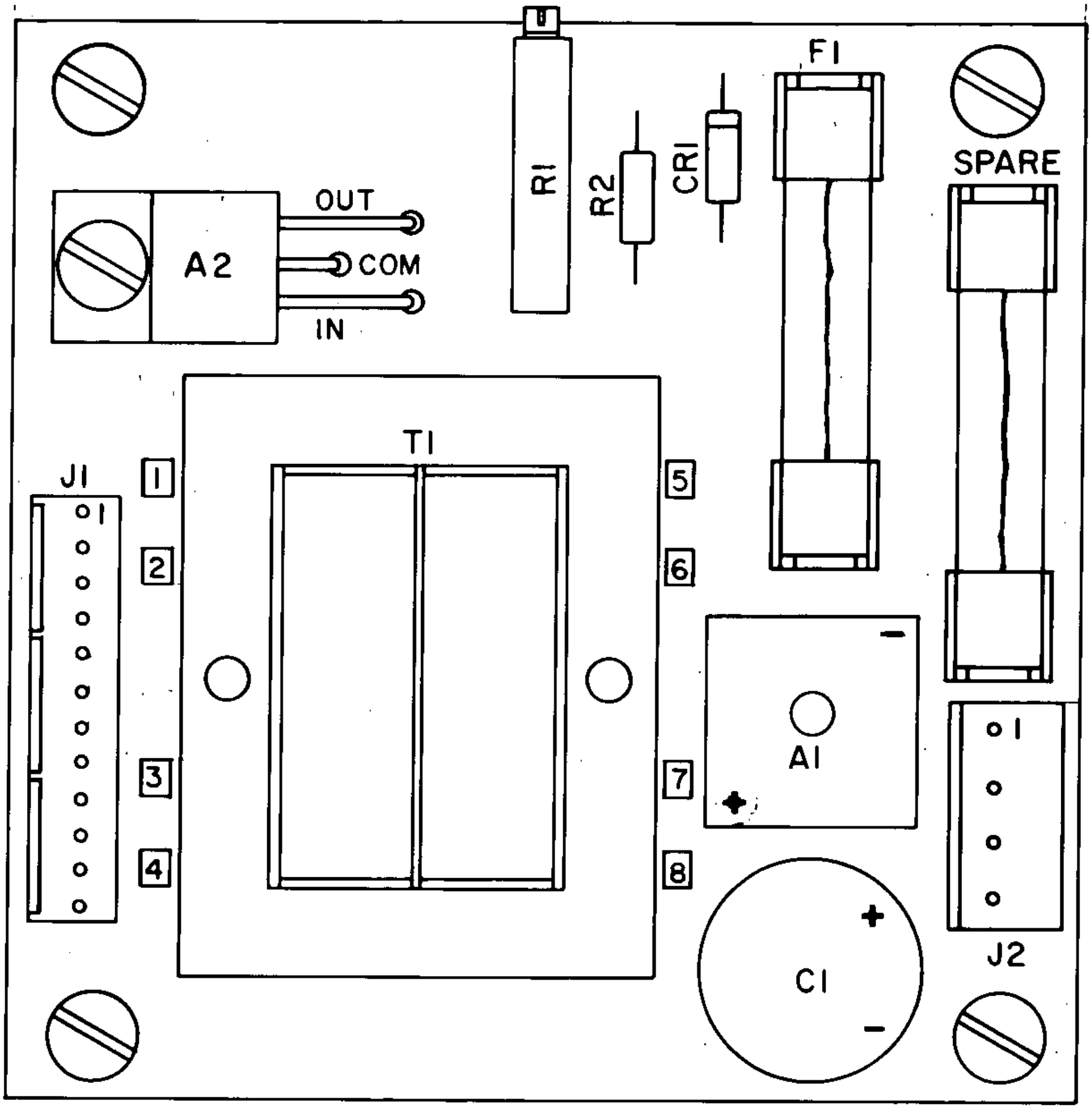


Figure 6-1. Battery Charger Component Layout, 11307-B23

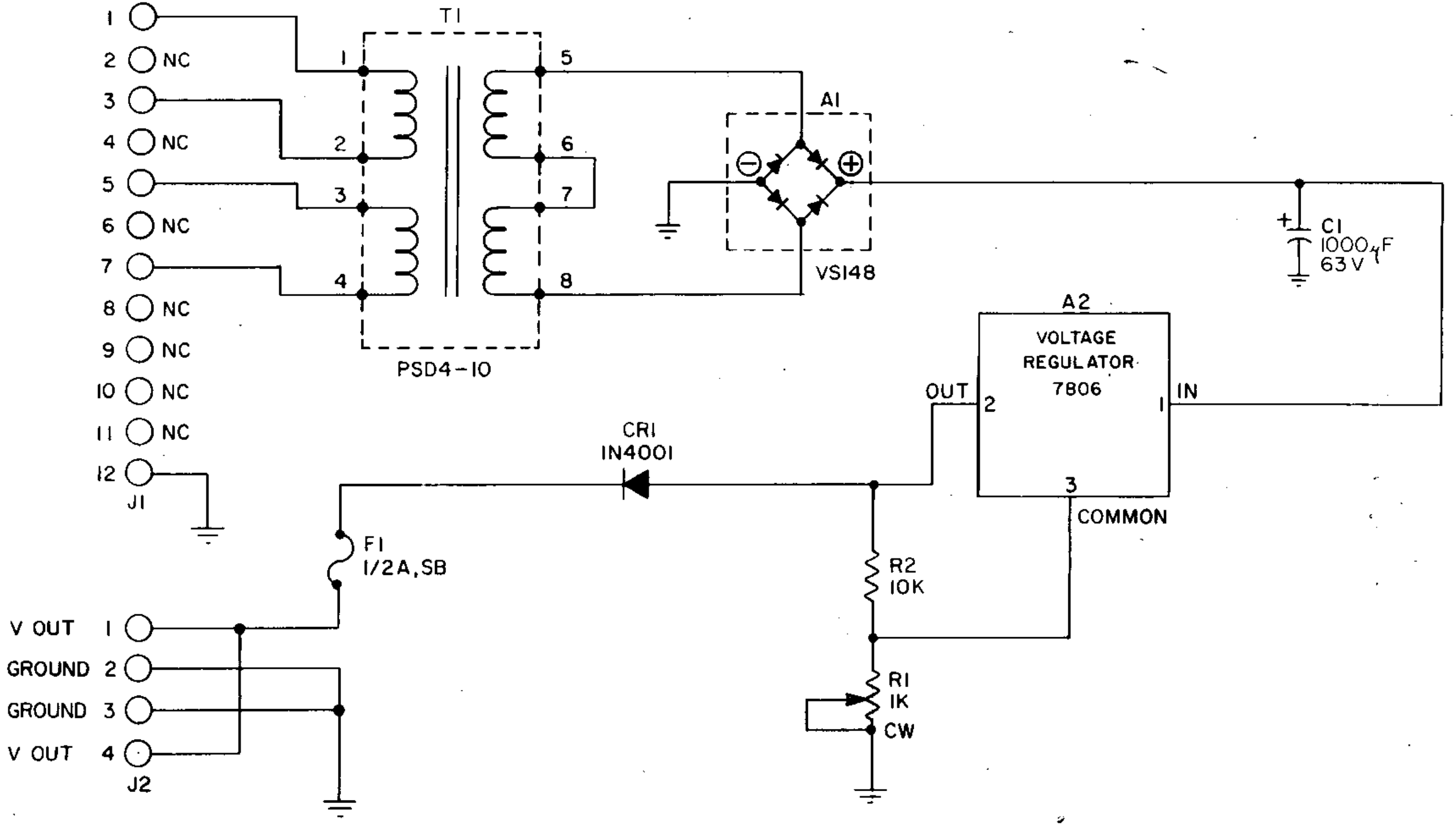


Figure 6-2. Battery Charger Schematic, 11307-B22A

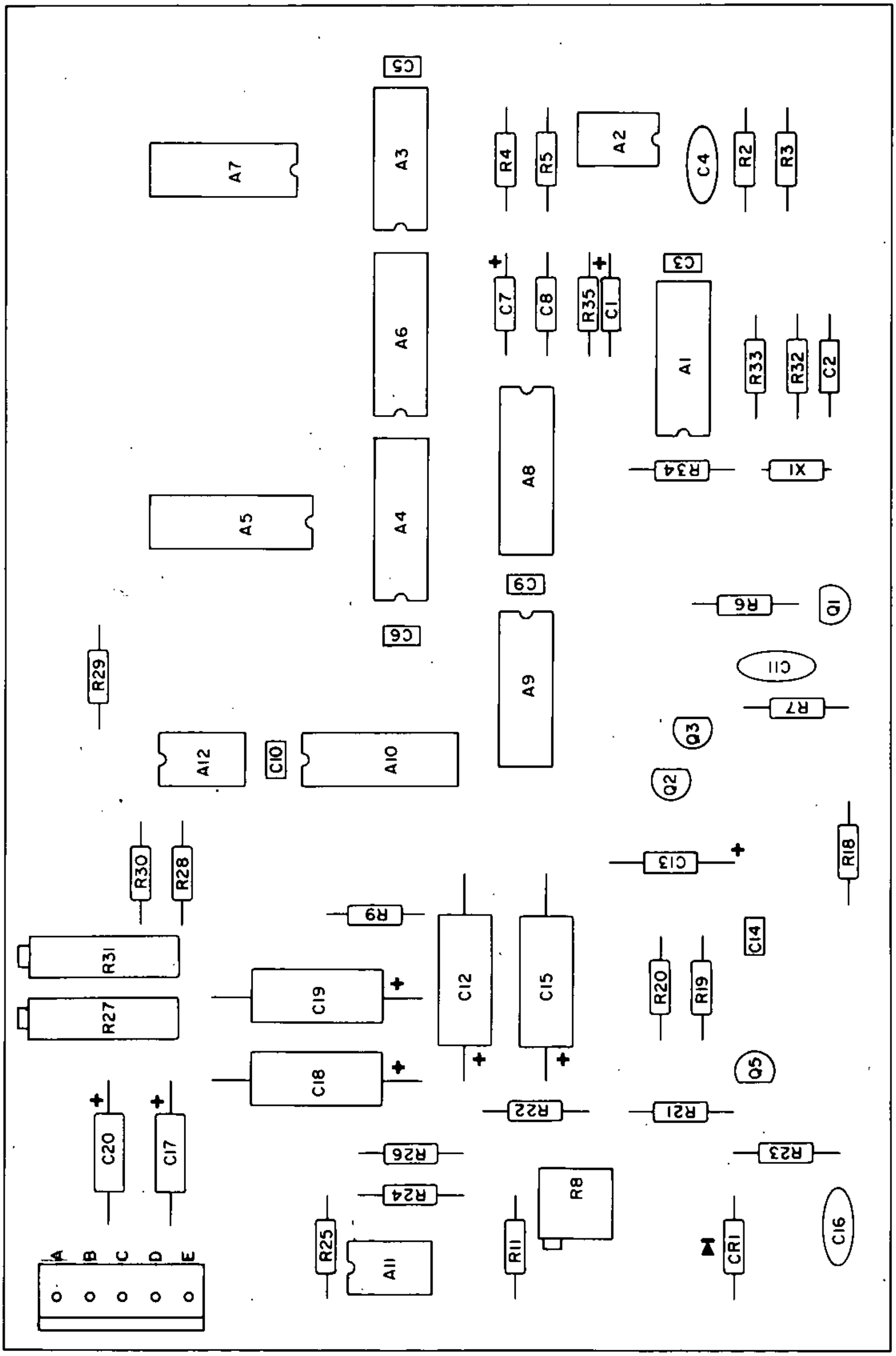


Figure 6-3. MP-2 Component Layout, 11306-C04

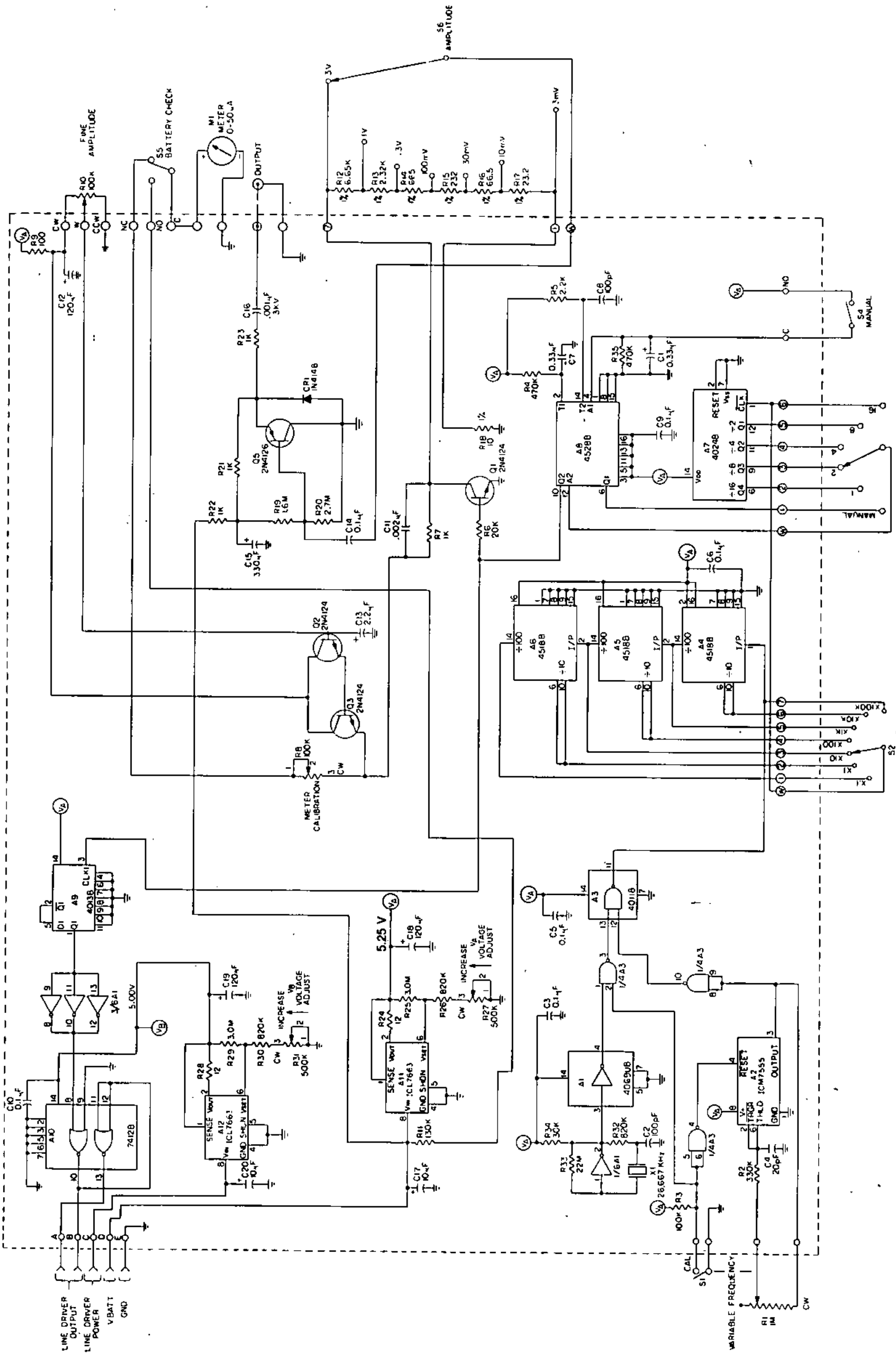
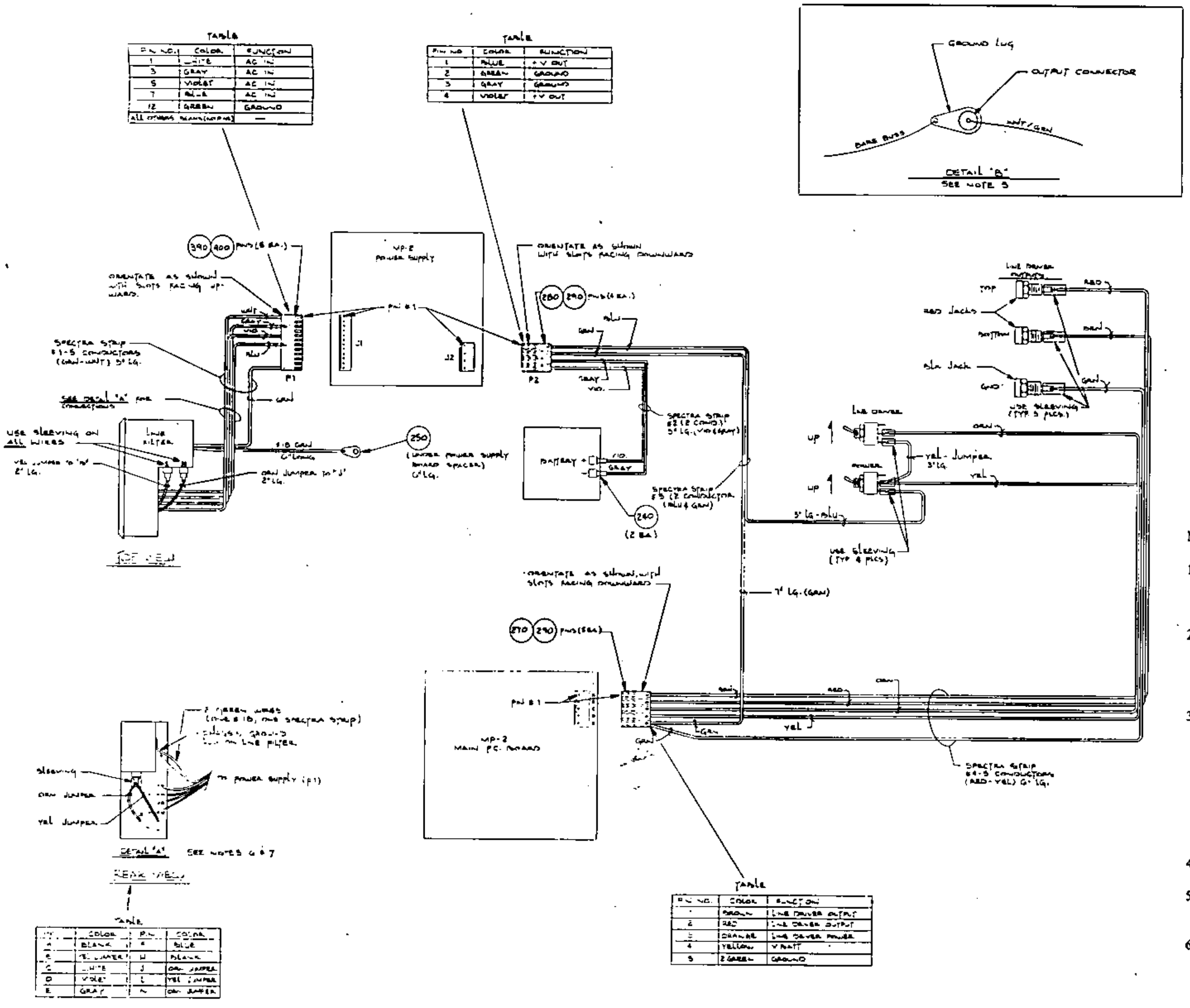


Figure 6-4. MP-2 Schematic, 11306-D03A


GROUND LUG
OUTPUT CONNECTOR
BARE BUSS
WHT/GRN
DETAIL "B"
SEE NOTE 5
MP-2
POWER SUPPLY
J1
J2
PIN # 1
P1
P2
390
400
PINS (8 EA.)
ORIENTATE AS SHOWN WITH SLOTS FACING UP-WARDS.
WHT
GRAY
VIO
BLU
SPECTRA STRIP #1-5 CONDUCTORS (GRN-WHT) 5" LG.
SEE DETAIL "A" FOR CONNECTIONS
GRN
USE SLEEVING ON ALL WIRES
LINE FILTER
YEL JUMPER TO "H" 2" LG.
GRN JUMPER TO "J" 2" LG.
#18 GRN 6" LONG
250
(UNDER POWER SUPPLY BOARD SPACER) 6" LG.
TOP VIEW
ORIENTATE AS SHOWN WITH SLOTS FACING DOWNWARD
280
290
PINS (4 EA.)
BLU
GRN
GRAY
VIO.
SPECTRA STRIP #2 (2 COND.) 5" LG. (VIO & GRAY)
BATTERY
+
-
VIO.
GRAY
240
(2 EA.)
SPECTRA STRIP #3 (2 CONDUCTOR (BLU & GRN)
5" LG.-BLU
7" LG. (GRN)
LINE DRIVER
POWER
UP
YEL - JUMPER 3" LG.
YEL
GRN
USE SLEEVING (TYP 4 PLCS)
LINE DRIVER OUTPUTS
TOP
BOTTOM
RED JACKS
BLK JACK
GND
RED
USE SLEEVING (TYP. 3 PLCS.)
ORIENTATE AS SHOWN, WITH SLOTS FACING DOWNWARD
270
290
PINS (5 EA.)
PIN # 1
MP-2
MAIN PC. BOARD
GRN
RED
YEL
SPECTRA STRIP #4-5 CONDUCTORS (RED-YEL) 6" LG.
2 GREEN WIRES (ONE #18, ONE SPECTRA STRIP)
CHASSIS GROUND LUG ON LINE FILTER
TO POWER SUPPLY (P1)
SLEEVING
GRN JUMPER
YEL JUMPER
DETAIL "A"
SEE NOTES 6 & 7
REAR VIEW
TABLE

PIN NO.	COLOR	FUNCTION
1	WHITE	AC IN
3	GRAY	AC IN
5	VIOLET	AC IN
7	BLUE	AC IN
12	GREEN	GROUND
ALL OTHERS	BLANK (NO PINS)	—

PIN NO.	COLOR	FUNCTION
1	BLUE	+ V OUT
2	GREEN	GROUND
3	GRAY	GROUND
4	VIOLET	+ V OUT

PIN NO.	COLOR	FUNCTION
1	BROWN	LINE DRIVER OUTPUT
2	RED	LINE DRIVER OUTPUT
3	ORANGE	LINE DRIVER POWER
4	YELLOW	V BATT
5	2 GREEN	GROUND

PIN	COLOR	PIN	COLOR
A	BLANK	F	BLUE
B	YEL JUMPER	H	BLANK
C	WHITE	J	GRN JUMPER
D	VIOLET	L	YEL JUMPER
E	GRAY	N	GRN JUMPER

NOTES:

1. All wiring 22 AWG. stranded spectra-strip, except green wire from line filter ground lug to ground solder lug.

2. All connectors and switches shown EXCEPT for the red and black banana jacks on the rear panel can be soldered or crimped to the harness before installation to the chassis.

3. On the lower right hand portion of the board (below the meter contact holes) are two wires - bare buss and wht/grn.

   The wht/grn wire solders to the center pin of the BNC connector and the bare buss wire solders to the connector ground lug, cut to length at this point. See Detail "B."

4. This drawing is not to scale.

5. item numbers correspond to the line numbers on MP2 SLBOM.

6. Remove the small operating voltage printed circuit board from the MEVE4 BEFORE doing any soldering to it. This board has the numbers "100, 220, 140 and 120" etched to it. Replace after all soldering operations are finished.

7. Use only enough heat to make a good solder joint when soldering to the MEVE4.

Figure 6-5. MP-2 Wiring Diagram, 11307-D07c